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Montana and the sky



Department of Transportation - Aeronautics Division

Vol. 45 No. 6

June 1994

Aviation Awareness Art Contest Winners

Winners of the 1994 Aviation Awareness Art Contest and their parents were flown to Helena and honored during an awards ceremony on May 26 conducted by Lieutenant Governor Dennis Rehberg. Following the ceremony, tours of the capitol and airport were conducted before return flights home.

The Aviation Awareness Art Contest is designed to increase student awareness regarding career opportunities in the field of aviation/aerospace and to broaden their

knowledge of the important role aviation/aerospace plays in today's world.

Winners are: Peter Michels, West Glacier, Category III (grades 9-12); Raya Alexandra, Billings, Category II (grades 5-8); and Burl Williams, Lewistown, Category I (grades 1-4).

Peter is a student of Mrs. Gopp, Columbia Falls High School. His poster depicted a Boeing 757 landing on an airport with a Cessna 152 flying high above the Rocky

See ART Winners, page 3



Congratulating Peter Michels are (l to r) Mike Ferguson, Gordon Brandes, Northwest Airlines and Lieutenant Governor Dennis Rehberg.

Aeronautics Board Meets

The Montana Aeronautics Board conducted a meeting June 3, 1994 at the Yellowstone Airport. The Board participated with SkyWest - Delta Connection and Delta Air Lines in helping "kick-off" SkyWest's service to West Yellowstone by joining in an informal gathering with airline representatives and local West Yellowstone officials.

Seasonal service at the Yellowstone Airport is effective June 1 through September 30 of each year.

The Board received reports on Division activities, including the Yellowstone Airport.

Bill Cloud, Transportation Planning Division, was present to speak on the progress of the Statewide Transportation Plan, a multi and intermodal plan that will focus on all types of transportation. Carolyn Colman, West Yellowstone Mayor, and members of her Yellowstone Airport Advisory Board were present to discuss the airport and other issues of common interest with the Board.

A tour of the Grizzly Discovery Center was conducted. This center was established to educate visitors to the Yellowstone area about the grizzly bear, its needs and its world, and to provide a home for problem bears. The Center currently cares for four bears.

The next meeting of the Aeronautics Board has not been scheduled.

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Administrator's Column

VA Flight Training Legislation: The current Veterans' flight training program will expire this coming October unless a bill (S.2094) sponsored by Senator Thomas Daschle of South Dakota passes. Senators Wendell Ford of Kentucky and Paul Simon of Illinois are co-sponsors of this bill. This bill is somewhat different than the current bill in that it permanently extends the program. Solo flight, dual flight instruction and ground school instruction as well as pre/post flight discussions will be eligible. Participating flight schools will still be required to be FAR Part 141 certified.



ATC Corporation Proposal Released: The Department of Transportation released their proposal to place the air traffic control (ATC) system under a federal corporation which will be called U.S. Air Traffic Services Corporation. A board of directors would govern and the make up would be the Secretary of Transportation, Secretary of Defense, representatives of the airlines, airport management, aviation labor, and general aviation. Funding would come from eighty (80) percent of the current transportation taxes with the remaining 20 percent going into the aviation trust fund. The general aviation fuel tax revenues would also go into the aviation trust fund. Fees to fund the corporation would remain at the existing levels for one year and then the board could increase user fees plus create new fees. General aviation would be exempt from the fees plus be guaranteed access to the national airspace system. The purpose for establishing the U.S. Air Traffic Services Corporation is to make the present ATC system more efficient by improving personnel management practices and improving equipment procurement.



FAA Drops MLS Program: FAA Administrator David Hinson announced that the FAA will halt further development of the Category 2 and 3 Microwave Landing Systems and concentrate on GPS. This move pleases most if not all of the U.S. aviation user industry including the Air Transport Association, the Helicopter Association International, Aircraft Owners & Pilots Association and others who have been trying to get the MLS funding cut by Congress in order to stop development of a system which has become obsolete before it's implementation which started over 20 years ago. There are a few MLS approved approaches in the U.S. The FAA will have to pay cancellation penalties to companies who have contracts for MLS. Some European nations will not be pleased with this move as they too have been in the implementation stages for MLS and have reservations about the U.S. Department of Defense owned Global Positioning System.



Russia: I recently returned from a flight to Russia and will write an article about this trip in next month's newsletter.

Ethanol Powered Plane

Dr. Max Shauck, professor and director of aviation sciences at Baylor University in Texas, will fly his plane powered on straight ethanol in the Billings Airshow on July 23 and 24. Dr. Shauck has been teaching at Baylor since 1975. Shauck, who was the 1991 recipient of the Harmon Trophy Award, has competed in aerobatic competitions and set many world records in aviation. Shauck was the first to make a transatlantic flight using ethanol as fuel. The National Governors Ethanol Coalition has made arrangements, through a grant from the U.S. Department of Energy for Dr. Shauck to participate in a number of airshows in the nation.

The Ethanol Producers and Consumers (EPAC) will sponsor a meeting and media event on July 22nd at the Billings Holiday Inn with the pilot and his entourage. EPAC is a non-profit organization with members who support the increased production and use of ethanol fuel.

Any questions regarding the plane or EPAC can be directed to Shirley Ball, Executive Director, EPAC at South Route, Box 206, Nashua, MT 59248 or call (406) 785-3722.



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ART WINNERS, from page 1

Mountains. Raya's entry was Wings of Flight and Burl's The Great Aviator.

As the winner of Category III, Peter will be attending the annual Experimental Aircraft Association (EAA) Air Academy from July 16 - 31 at Oshkosh, WI. The academy is held in conjunction with the 42nd Annual EAA Fly-In Convention. Peter's tuition is paid by contributions through Montana's aviation community

and organizations collected during the Montana Aviation Conference. Round-trip transportation to the academy is provided by Northwest Airlines. Each year, Northwest Airlines continues to support Montana's youth and their interest in the wonderful world of aviation.

Thanks to each of you and to Northwest Airlines for contributing so generously to this program.



Raya Alexandra, an 8th grade student at Lewis & Clark Middle School, Billings and student of Mr. Whitmer receives her award from Lt. Gov. Rehberg.

Burl Williams accepts his plaque from Lt. Gov. Rehberg. Burl is a 4th grade student at Lewis & Clark School in Lewistown and instructed by Mrs. Rutherford.



Calendar

- June 3** — Montana Aeronautics Board Meeting, West Yellowstone
- June 4** — Miles City Arpt. Appreciation Day
- June 7 - 12** — MAAA Air Tour
- June 18 - 19** — Annual Father's Day Antique Fly-in, Beacon Star Antique Air Field, call Frank Bass 538-7616
- June 25** — Plains Fly-in, breakfast and lunch
- June 25** — Fly-in Breakfast and Little Big Horn Days, Hardin. Breakfast - 0730, parade - 1100, re-enactment - 1330. Call Bob Crane at 665-1006
- June 25 - 26** — Museum of Mountain Flying Airshow, Johnson-Bell Field, Missoula
- July 6 - 10** — Northwest EAA Fly-in, Arlington, WA
- July 7 - 9** — Sixth Annual Seeley Lake Fly-in, contact Aeronautics Div. 444-2506 for itinerary and registration form
- July 8 - 10** — Family Fly-in and Safety Expo, Helena
- July 9** — Dutton Fun-day, Fly-in, EAA Young Eagle Rides, for info. call 476-3315
- July 9 - 10** — MAAA work weekend, Three Forks
- July 11 - 16** — Aviation Camp. Rocky Mountain College, Billings. Grades 7-11. Call Erik Anderson 259-5294 or John Cech 657-1040
- July 15 - 16** — Anaconda Fly-in
- July 15 - 17** — Schafer Meadows Work Ses.
- July 15 - 17** — Howard Fly-in, Kalispell
- July 23 - 24** — Big Sky Int'l Airshow, Billings
- July 24 - August 6** — 15 Meter National Soaring Contest, Livingston
- July 28 - August 3** — 42nd Annual EAA Fly-in Convention, Oshkosh, WI
- July 30 - 31** — Lewis & Clark Days Airshow, Cut Bank
- July 30 - 31** — Red Deer International Airshow, Red Deer, Alberta, Canada
- August 4 - 7** — MAAA Fly-in, Three Forks
- August 20 - 21** — Lethbridge International Air Show, Lethbridge, Alberta, Canada
- August 22 - 24** — INAC Annual Conference, Cheyenne, WY
- August 26 - 27** — Annual Barnstormers Fly-in, Columbus
- September 3 - 5** — Yellowstone Family Fly-in, West Yellowstone
- September 16 - 18** — Mountain Search Pilot Clinic, Kalispell
- September 23 - 25** — Montana Pilot's Association Fall Fly-in, Glendive

How The Global Positioning System Works

(Reprinted with permission of IFR Refresher Magazine. For subscription information call 800-424-7887. Written by: Leo V. Eldredge)

The Global Positioning System (GPS) is a satellite-based navigation system developed by the U.S. Department of Defense (DoD).

Although GPS was originally designed for military use, GPS was also used to replace ground-based navigation aids (VOR, NDB, etc.) Civilian applications for GPS will dramatically change the way all users navigate in U.S. airspace. To understand how GPS will change the flight operations, I'll discuss the GPS system including accuracy, availability, integrity and augmentation.

Concept of operation

The GPS system consists of a space segment (24 satellites in 11,000 nm orbits), a control segment (a series of five land-based monitor and control stations) and a user segment (GPS receiver equipped air/sea/land users). Each satellite broadcasts frequency ranging codes and precise time obtained from an onboard atomic clock. The satellites transmit on two frequencies: L1 at 1575.42 MHz and L2 at 1227.6 MHz. DoD controls the space and control segments. Initial operational capability of the system will occur when a constellation of 24 satellites is achieved. Hopefully this will occur this winter.

GPS user equipment (air/sea/land) receives the satellite ranging signals and compares the signal to precise time information to determine the range to the satellite. By receiving the signals from four satellites, a GPS receiver can use triangulation to determine a precise position. The ranging signals are provided in two forms; P-Code (carried on L1 and L2) and CA-Code (carried on L1 only).

P-Code is used by the military and CA-Code is for civil users. The fundamental difference is accuracy. The GPS system provides 21 meter accuracy for military users and 100 meter accuracy for civil users.

Civil GPS

As a service to the civilian community, the Defense Department is providing the GPS CA-Code free of charge to civil aviation for the next 10 years and the foreseeable future beyond. To allay any concerns over the long term availability of GPS, civil users will be notified six years in advance of any termination or alteration of the CA-Code. As a result, the FAA is rapidly implementing GPS into the national airspace system.

Currently, the FAA has approved GPS for IFR navigation for enroute, terminal and non-precision approaches for aircraft equipped with technical standard order (TSO) C-129 equipment. The potential for GPS as a primary navaid is immense. The airspace system can be reconstructed to permit direct routing, reduced separation for oceanic operations and parallel tracks. GPS has demonstrated the capability to provide non-precision approaches at any airport regardless of available ground-based navaids. GPS signal coverage is global and can be used to create state-of-the-art airspace

systems for developing countries that have little or no infrastructure.

Performance

Testing to date has determined that GPS accuracy is superior to traditional ground-based navaids. In-flight evaluations by the U.S. Air Force Instrument Flight Center at Randolph Air Force Base for non-precision approaches demonstrated P-Code GPS to be well within the lateral confines of protected airspace provided for today's localizer approach. Despite the advantages of GPS lateral accuracy, problems remain in the areas of integrity and vertical accuracy for precision approaches.

GPS Integrity

GPS integrity is the ability to provide timely warning to users when the system shouldn't be used for navigation. Currently, the GPS system doesn't provide the indications of a warning (e.g., "off" flags) for some GPS failure modes. Warnings need to be generated and displayed to the pilot in a timely manner so that a decision to continue an approach or execute a missed approach can be made without compromising safety. For example, a VOR station provides integrity by removing a signal from use and displaying an "off" flag to the pilot within 10 seconds of an out-of-tolerance condition.

Various methods for incorporating integrity warnings for GPS are being considered. The most promising schemes to date are known as receiver autonomous integrity monitoring (RAIM) and GPS integrity broadcast (GIB). RAIM is a technique whereby a GPS receiver/processor determines the integrity of the GPS navigation signals by performing a consistency check within the receiver. The benefits of RAIM are limited when less than six satellites are being tracked by the aircraft GPS receiver.

On the other hand, GIB is a non-DoD system in development that interfaces with the GPS and broadcasts integrity warnings to users in a designated area, based on measurements made by a network of ground-based monitor stations. Integrity remains a critical requirement for implementing GPS as the standard.

Accuracy

While GPS as a stand-alone navaid is suitable for non-precision approaches and enroute navigation (using TSO C-129 equipment), it must be accompanied by ground-based stations to be accurate for precision approaches. The majority of civil users require no more than Category 1 (200-foot decision height) precision capability. If GPS is capable of achieving CAT I, we can equip our aircraft with one navigation system rather than two or three. Cost savings and simplified design make this a highly advantageous alternative.

Ground-based stations

For precision approaches the primary method for improving accuracy, availability and integrity is to use differential corrections. Differential GPS uses a precisely surveyed land-based reference

Continued on next page

station to receive GPS signals, compute satellite errors and transmit the corrections to the aircraft. Local area differential (LDGPS) transmits the corrections from the reference station directly to the aircraft and requires hundreds of ground stations to cover the major airports in the conterminous United States (lower 48).

Wide area differential (WDGPS) requires 20-30 differential stations to relay corrections from the monitor stations to a geostationary satellite which in turn transmits those corrections to user aircraft. Assuming GPS will require some type of augmentation, LDGPS and WDGPS have differing advantages and disadvantages.

Local Area Differential

LDGPS performs well within CAT I precision tolerances, however, the availability of this system is limited by line-of-sight communications from the differential stations. While LDGPS offers a technically simpler alternative, the cost of installing hundreds of ground stations could be prohibitive. Also, the precision accuracy isn't available to users beyond line-of-sight coverage. In addition, confirmation of system integrity is still required via some other means beyond the coverage area for the differential station.

Wide Area Differential

WDGPS offers the advantage of satellite-based communications with no line-of-sight limitations, but there is still some degradation of accuracy due to the transmission of signals through the ionosphere. The degree of degradation of the WDGPS corrections hasn't yet been fully tested. If WDGPS proves accurate enough, it offers several advantages. First, fewer ground stations would be required to cover the conterminous U.S. Second, the service would provide a precision approach to all airports in the "lower 48" that today might not have an instrument approach. Third, WDGPS service could be expanded to include world-wide coverage. Finally, the geostationary communication link could also be used to relay integrity information.

Realistic Alternatives

The requirements for a GPS-based system will require a mix of both WDGPS and LDGPS. While the majority of the users might only need a WDGPS system to provide CAT I approach capability, commercial air carriers insist on the increased accuracy of a LDGPS system. Therefore, it's conceivable that implementation of a differential GPS land-based support system will require both WDGPS and LDGPS.

The equipment on board the aircraft should be able to receive both LDGPS and WDGPS signals and use whichever corrections are best suited for the position of the aircraft. The aircraft integration must also properly warn the pilot of limitations of the GPS signal so the pilot can decide whether a non-precision or precision approach can be flown. The successful implementation of GPS as a single navaid for DoD and civil users will hopefully reduce costs and improve service for the entire aviation community.

Leo V. Eldredge is an ATP and former U.S. Air Force pilot who has flown more than 300 GPS approaches.

Overflying National Wildlife Refuges

(Reprinted with permission from NASA's Aviation Safety Reporting System, Callback newsletter)

I was enroute in a loose formation with other aircraft (all classic taildraggers) flying southbound along the coastline.

The wind was light and the air was very smooth, so occasionally the flight was down to about 100 feet AGL over the open water. I didn't perceive that there was any problem doing this since low-level flight over open water is legal according to the FARs and I was more than 500 feet from anything manmade, or any person.

An engine failure wouldn't have been risky since we were in cruise at about 105 mph and could have easily pulled up and landed on the beach...Upon our return to our home base, I looked at our route and noticed a blue circle with dots inside it around an island. The legend on the sectional didn't have airspace depicted in such a way, but it was similar to a dry lake-tidewater area.

I later was talking to another CFI and he said that he recalled something about wildlife areas and overflights somewhere.

I spent hours looking and found it in the AIM. According to section 7-66 of the AIM, pilots are requested to maintain 2,000 feet AGL over National Parks, Seashores, etc...Had I known about the request, I would have honored it.

I spent hours looking and found it in the AIM. According to section 7-66 of the AIM, pilots are requested to maintain 2,000 feet AGL over National Parks, Seashores, etc...Had I known about the request, I would have honored it. Such areas should be better marked on the sectionals. I'm sure lots of other pilots are completely unaware these areas exist or what they mean.

Sectional aero charts *do* depict the symbol for the boundary of a National Park, Fish and Wildlife, or Forest Wilderness Primitive area. However, this symbol and related regulatory information appear in a legend on an *inside* panel of the chart, not on the front panel.

The reason for a 2,000-foot altitude buffer is to prevent bird strikes with overflying aircraft, as well as noise disturbance. A note to Paragraph 7-66b of the AIM further explains that 2,000 feet "above the *surface*" means "...the highest terrain within 2,000 feet laterally of the route of flight, or the upper-most rim of a canyon or valley."



Congratulations go out to Ray Buell of Helena for earning his private pilots license on April 2, 1994.

Ray is a MT Transportation Department chemist who always dreamed of learning how to fly. He began his training in Augusta in the summer of 1948 with flight instructor Cliff McBratney. Later that same year, because of the pressures of raising a family, Ray had to give up flying indefinitely. Ever since he has longed to take up flying again and has attended many airshows and aviation events which have only strengthened his resolve to be flying again. In the summer of 1993 Ray joined the Sleeping Giant Flying Club in Helena and resumed his training in a Cessna 150. His original training was in a Taylorcraft.

Ray was a pleasure to have as a student. Even on bad days where disaster was imminent, you couldn't wipe the smile off his face. Now the smile is really permanent.

Congratulations Ray from K.V. Knebel, CFI.



Students from Drummond participated in the Division's aviation/aerospace career awareness program last month. The program includes a briefing at the Division describing its functions and tours of a combination of the following facilities: National Weather Service; Army Aviation Support Facility, Montana National Guard; FAA Control Tower; Vo-Tech Aviation Maintenance School and the Helena Airport Crash Fire Rescue facility. Tours conclude with an orientation flight.

These Drummond students hold EAA Young Eagle Certificates they were awarded following their flight. Students participating in the career awareness program are enrolled as Young Eagles with the Experimental Aircraft Association. Since the inception of the Young Eagles program, the Montana Aeronautics Division has provided introductory flights to over 350 students.

Aviation and Technology Awareness Week

An alphabetical fleet of subjects — including F-16s, B-52s and KC-135s joined the more traditional three R's at Laurel's schools in April.

Aviation and Technology Awareness Week was started to "give our kids the best education in aviation and technology that we can find", according to American history teacher and event organizer, Jack Bayne. This year the event tripled compared to 1992 and came together due to efforts of teachers, community leaders and aviators.

Laurel students heard lectures and observed demonstrations by Burlington Northern Railroad, the National Aeronautics and Space Administration, Boeing Aircraft, Montana Power Co., Yellowstone Rural Electrification Administration, Pepsi and others.



Additional speakers and displays arrived from a number of Air Force, Navy, Coast Guard and National Guard bases.

About 50 aircraft, including ultralights, agricultural, antique and other non-commercial types were on static display at the Laurel Airport. Also on display were helicopters, gliders, parachutes, parasails, World War II aircraft and Gravity Storm, a jet dragster. The Big Sky Parachute team and the Montana Smoke Jumpers also participated.

Congratulations to all of you who worked and strived to make this a memorable event for the Laurel area students — your program and participation was very impressive and a great success!



N69DK built by Don and Ruth Keller with help and encouragement from Clayton Wilhelm took a little over four years to finish.

It is powered by a Ford 3.8L V6 with the radiator lying flat under the rear of the engine. The fuselage is from a damaged Tri-Pacer, however, only the cabin is original. The rest of the tubing was replaced and the fuselage extended two feet. A greenhouse roof was added as well as an extended baggage compartment that provides room to sleep when the back seat is removed. The wing span is 32 feet with 15 feet of flaps. It holds 54 gallons of fuel using either 100LL or super unleaded and burns 7.3 gallons per hour.

N69DK is based on the Helena Airport.

FAA Issues Certificates

Private

James Lovitt
Lynnet Thomas

Billings
Stevensville

Ground Instructor

Donald Parrott

Roundup

CFI

John Richardson
Donald Parrott

Billings
Roundup

CFI Renew

Ronald Guyton
Robert Vanmeter

Whitefish
Helena

Bravo Mike Available

The Aeronautics Division has been furnished with a copy of Bravo Mike, a 24-minute video tape of a Lancair 320 project of Mike Campbell's of Scottsdale, AZ. Three and one-half years and 4,400 building hours later, this showpiece christened "Dream Catcher" is a perfect example of what can be done by an individual with a little motivation and attention to detail.

Interested persons should call the Division at 444-2506 to borrow the tape.

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